IN THE CLAIMS:

1. (currently amended) A method for producing ~~grain boundary-free~~ polycrystalline silicon, the method comprising:

forming a film of amorphous silicon;

using a 2N-shot laser irradiation process to form polycrystalline silicon in a first area of the film, where the film is exposed to a series of 2-shot laser irradiation steps in orthogonal directions, and where "N" is the number of steps in the series;

selecting a second area, included in the first area; and,

using a directional solidification (DS) process to anneal the second area.

2. (currently amended) The method of claim 1 wherein exposing the film to a series of 2-shot laser irradiation steps in orthogonal directions, where "N" is the number of steps in the series, includes ~~using a 2N-shot laser irradiation process to form polycrystalline silicon in a first area of the film includes sequencing irradiation in odd and even iteration patterns, the patterns including~~:

~~for odd numbered iterations,~~ projecting a first laser beam, in two steps, through a first aperture pattern oriented in a first direction; [[and,]]

~~for even numbered iterations,~~ projecting the first laser beam, in two steps, through a second aperture pattern oriented in a second direction orthogonal to the first direction; and,

repeating a sequence of 2-shot orthogonal laser irradiations N number of times.

3. (original) The method of claim 2 wherein using a 2N-shot laser irradiation process to form polycrystalline silicon in a first area of the film includes forming in the first area:

a first plurality of parallel grain boundaries oriented in the first direction and having consecutive grain boundaries equally spaced by a first width; and,

a second plurality of parallel grain boundaries oriented in the second direction and having consecutive grain boundaries equally spaced by a second width.

4. (original) The method of claim 3 wherein forming first and second pluralities of grain boundaries having respective consecutive grain boundaries equally spaced by first and second widths, respectively, includes:

selecting the first width in a range of 0.1 microns (μm) to 100 μm; and,

selecting the second width in a range of 0.1 μm to 100 μm.

5. (original) The method of claim 4 wherein selecting the first and second widths in respective ranges of 0.1 μm to 100 μm includes:

selecting the first width in a range of 0.1 μm to 0.6 μm; and,

selecting the second width in a range of 0.1 μm to 0.6 μm.

6. (original) The method of claim 5 wherein selecting the first and second widths in respective ranges of 0.1 μm to 0.6 μm includes:

selecting the first width in a range of 0.3 μm to 0.6 μm; and,

selecting the second width in a range of 0.3 μm to 0.6 μm.

7. (original) The method of claim 4 wherein selecting the first and second widths in respective ranges of 0.1 μm to 100 μm includes:

selecting the first width in a range of 0.6 μm to 10 μm; and,

selecting the second width in a range of 0.6 μm to 10 μm.

8. (original) The method of claim 4 wherein selecting the first and second widths in respective ranges of 0.1 μm to 100 μm includes:

selecting the first width in a range of 10 μm to 100 μm; and,

selecting the second width in a range of 10 μm to 100 μm.

9. (original) The method of claim 3 wherein forming first and second pluralities of grain boundaries with first and second widths, respectively, includes selecting the first and second widths to be equal.

10. (original) The method of claim 3 wherein sequencing irradiation in odd and even iteration patterns includes performing one odd iteration and one even iteration.

11. (currently amended) The method of claim 3 wherein using a DS process to anneal the second area includes:

subsequent to forming polycrystalline silicon in the first area, selecting a third aperture pattern and a second area with a top surface;

orienting the third aperture pattern ~~and a second area top surface~~ in the first direction;

projecting a second laser beam through the third aperture pattern as follows: ~~to anneal a first portion of the second area;~~

~~sequentially:~~

advancing the third aperture pattern ~~and the second area top surface~~ in the first direction;

projecting the second laser beam through the third aperture pattern; and,

sequentially annealing ~~remaining~~ portions of the second area; and,

selectively removing grain boundaries in the second area.

12. (original) The method of claim 11 wherein selectively removing grain boundaries in the second area includes:

smoothing ridges formed by the first and second pluralities of grain boundaries; and,

removing grain boundaries with the exception of first plurality grain boundaries.

13. (original) The method of claim 12 wherein selecting the second area includes:

selecting a first pair of sides parallel to and located between first plurality grain boundaries; and,

selecting a second pair of sides parallel to and located between second plurality grain boundaries.

14. (currently amended) The method of claim 13 wherein selecting a first pair of sides located between first plurality grain boundaries includes co-locating ~~selecting~~ at least one first pair side ~~to be co-located~~ on a first plurality grain boundary.

15. (currently amended) The method of claim 13 wherein selecting a first pair of sides located between first plurality grain boundaries includes selecting a first pair of sides located between consecutive grain boundaries from the first plurality of grain boundaries.

16. (currently amended) The method of claim 15 wherein selecting a first pair of sides located between consecutive first plurality grain boundaries includes co-locating ~~selecting~~ at least one first pair side ~~to be co-located~~ on a consecutive first plurality grain boundary.

17. (currently amended) The method of claim 13 wherein selecting a second pair of sides located between second plurality grain boundaries includes co-locating ~~selecting~~ at least one second pair side ~~to be co-located~~ on a second plurality grain boundary.

18. (currently amended) The method of claim 11 wherein using the 2N-shot laser irradiation process to form polycrystalline silicon in the first area of the film includes performing a final laser irradiation shot in the first direction

~~wherein orienting the third aperture pattern and a second area top surface in the first direction includes selecting the first direction the same as a direction of a last iteration in a 2N-shot iteration sequence performed on the first area~~.

19. (original) The method of claim 3 wherein projecting a first laser beam through first and second aperture patterns includes using a first excimer laser source with a wavelength between 248 nanometers (nm) and 308 nm to supply the first laser beam; and,

wherein projecting a second laser beam through a third aperture pattern includes using a second excimer laser source with a wavelength between 248 nm and 308 nm to supply the second laser beam.

20. (original) The method of claim 3 wherein projecting a first laser beam through first and second aperture patterns includes projecting the first laser beam for a pulse duration of up to 300 nanoseconds (ns); and,

wherein projecting a second laser beam through a third aperture pattern includes projecting the second laser beam for a pulse duration of up to 300 ns.

21. (original) The method of claim 20 wherein projecting a first laser beam through first and second aperture patterns includes projecting the first laser beam for a pulse duration of up to 30 ns.

22. canceled

23. (original) The method of claim 20 wherein projecting the second laser beam through the third aperture pattern includes projecting the second laser beam for a pulse duration of up to 30 ns.

24. canceled

25. (currently amended) The method of claim 3 wherein using a 2N-shot laser irradiation process to form polycrystalline silicon in a first area of the film ~~projecting a first laser beam to anneal the first area~~ includes:

exposing the first area to a first energy density from the first laser beam;

~~the method further comprising:~~

projecting a third laser beam, with a second energy density, onto the first area; and,

~~exposing the first area to a second energy density from the third laser beam; and,~~

~~wherein annealing the first area includes:~~

~~summing the first and second energy densities to yield a third energy density; and,~~

annealing the first area in response to the first and second ~~third~~ energy densities ~~density~~.

26. (original) The method of claim 25 wherein projecting a third laser beam onto the first area includes projecting, from

a solid state laser source, a third laser beam with a wavelength of 532 nm and a pulse duration of between 50 ns and 150 ns.

27. (original) The method of claim 25 wherein projecting a third laser beam onto the first area includes projecting, from a carbon dioxide (CO_2) laser source, a third laser beam with a wavelength in a range of 10.2 μm to 10.8 μm and a pulse duration of up to 4 milliseconds (ms).

28. (currently amended) The method of claim 3 wherein using a 2N-shot laser irradiation process to form polycrystalline silicon in a first area of the film ~~projecting a first laser beam to anneal the first area~~ includes exposing:

the first area to a fourth energy density from the first laser beam;

~~the method further comprising:~~

exposing the first area to a first lamp light having a fifth energy density; and

~~exposing the first area to a fifth energy density from the first lamp light; and,~~

~~wherein annealing the first area includes:~~

~~summing the fourth and fifth energy densities to yield a sixth energy density; and,~~

annealing the first area in response to the fourth and fifth ~~sixth~~ energy densities ~~density~~.

29. (original) The method of claim 28 wherein exposing the first area to a first lamp light includes exposing the first area to light from an excimer lamp with a wavelength less than 550 nm.

30. (currently amended) The method of claim 28 wherein exposing the first area to a first lamp light includes exposing <u>the substrate underlying</u> a first bottom surface of the amorphous silicon film ~~including the~~ first area.

31. (currently amended) The method of claim 28 wherein exposing the first area to a first lamp light includes exposing a first top surface of the amorphous silicon film ~~including the~~ first area.

32. (currently amended) The method of claim 11 wherein projecting a second laser beam to anneal the second area includes<u>:</u>

exposing the second area to a seventh energy density from the second laser beam;

~~the method further comprising:~~

projecting a fourth laser beam onto the second area <u>having an eighth energy density</u>; and,

~~exposing the second area to an eighth energy density from the fourth laser beam; and,~~

~~wherein annealing the second area includes:~~

~~summing the seventh and eighth energy densities to yield a ninth energy density; and,~~

annealing the second area in response to the seventh and eighth energy densities ~~ninth energy density~~.

33. (original) The method of claim 32 wherein projecting a fourth laser beam onto the second area includes projecting, from a solid state laser source, a fourth laser beam with a wavelength of 532 nm and a pulse duration of between 50 ns and 150 ns.

34. (original) The method of claim 32 wherein projecting a fourth laser beam onto the second area includes projecting, from a CO_2 laser source, a third laser beam with a wavelength in a range of 10.2 μm to 10.8 μm and a pulse duration of up to 4 ms.

35. (currently amended) The method of claim 11 wherein projecting a second laser beam to anneal the second area includes:

exposing the second area to a tenth energy density from the second laser beam;

~~the method further comprising:~~

exposing the second area to a second lamp light having an eleventh energy density; and

~~exposing the second area to an eleventh energy density from the second lamp light; and,~~

~~wherein annealing the second area includes:~~

~~summing the tenth and eleventh energy densities to yield a twelfth energy density; and,~~

annealing the second area in response to the tenth and eleventh energy densities ~~twelfth energy density~~.

36. (original) The method of claim 35 wherein exposing the second area to a second lamp light includes exposing the second area to light from an excimer lamp with a wavelength less than 550 nm.

37. (currently amended) The method of claim 35 wherein exposing the second area to a second lamp light includes exposing the substrate underlying a ~~second~~ bottom surface of the amorphous silicon film ~~including the~~ second area.

38. (currently amended) The method of claim 35 wherein exposing the second area to a second lamp light includes exposing a ~~second~~ top surface of the amorphous silicon film ~~including the~~ second area.

39. (currently amended) The method of claim 11 further comprising:

forming a transparent substrate ~~layer~~;

forming a diffusion barrier overlying the substrate ~~layer~~ and underlying the first area;

wherein forming the film of amorphous silicon includes forming the film overlying the diffusion barrier;

the method further comprising:

subsequent to annealing the second area, forming in the second area, a transistor channel with a length[[,]] oriented in the first direction, and a width;

forming in the first area, source and drain regions adjacent to, and interposing the channel region;

forming a gate dielectric layer overlying the transistor channel, source, and drain regions, the dielectric thickness in a range of 20 angstroms (A) to 500 A over the channel region; and,

forming a gate electrode overlying the gate dielectric layer.

40. (currently amended) The method of claim 39 wherein forming a channel region with a length includes forming the channel length with a first pair of sides parallel to and located between a pair of grain boundaries from the first plurality grain boundaries; and,

wherein forming a channel region with a width includes forming the channel width with a second pair of sides parallel to and located between a pair of grain boundaries from the second plurality grain boundaries.

41. (currently amended) The method of claim 40 wherein forming the channel length with a first pair of parallel sides ~~located between a pair of first plurality grain boundaries~~ includes co-locating at least one side from the first pair on one of the grain boundaries from the [[a]] first plurality of grain boundaries ~~boundary~~.

42. (currently amended) The method of claim 40 wherein forming the channel length with a first pair of parallel sides

~~located between a pair of first plurality grain boundaries~~ includes forming the channel length with a first pair of parallel sides located between a pair of consecutive grain boundaries from the first plurality of grain boundaries.

43. (currently amended) The method of claim 42 wherein forming the channel length with a first pair of parallel sides ~~located between a pair of consecutive first plurality grain boundaries~~ includes co-locating at least one side from the first pair on one of the grain boundaries from the [[a]] first plurality of grain boundaries ~~boundary~~.

44. (currently amended) The method of claim 40 wherein forming the channel width with a second pair of parallel sides ~~located between a pair of second plurality grain boundaries~~ includes co-locating at least one side from the second pair on one of the grain boundaries from the [[a]] second plurality of grain boundaries ~~boundary~~.

45-64. canceled